Enzyme Sugar-Ethanol Platform and Advanced Pretreatment Interim Project Reviews

James D. McMillan
National Bioenergy Center
National Renewable Energy Laboratory

http://www.nrel.gov/bioenergy.html

Golden, CO
May 1-2, 2003

Outline

- Biomass Program Overview
  - Priorities
  - Structure
  - Project management framework
- Review Details
  - Objectives
  - Format
  - Schedule

Office of the Biomass Program Priorities

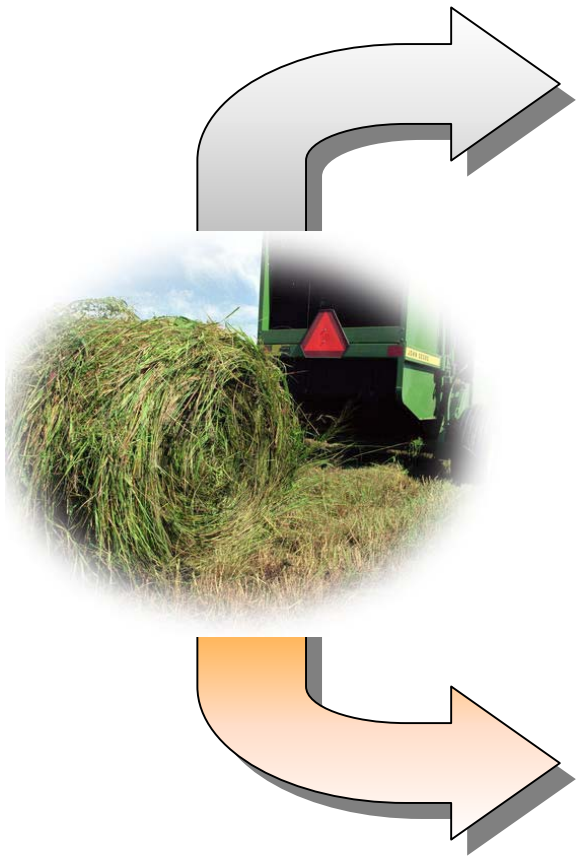
- Reduce dependence on foreign oil
- Create a new domestic bioindustry

➢ *Emphasis on creating and commercializing integrated biorefineries that use renewable biomass feedstocks to produce suites of fuel, energy and chemical products*

Implications of Priorities

- *Emphasize RD&D on biomass conversion to liquid fuels to maximize the potential to displace imported petroleum*
  - Petroleum now mostly used to make liquid transportation fuels
    - Gasoline, diesel, kerosene, etc.
  - Comparatively modest amounts are used to make chemicals or power
    - Much less petroleum displacement potential in increasing production of bio-based chemicals or power

Routes to Biofuels



Bio/chemical transformation of natural compounds

- ***Ethanol from sugars***
- **Biodiesel from renewable oils**

Thermal reduction to "syngas" (H_2, CO) chemical building blocks

- **Traditional chemistry**
- **Fischer-Tropsch diesel, gasoline**
- **Methanol, other alcohols (bio/catalytic)**

OBP Structure

Office of the Biomass Program

Advanced R&D

Systems Integration

Biochemical/ Thermochemical Conversion

System Validation/ Verification

Early Stage Development

Later Stage & Implementation

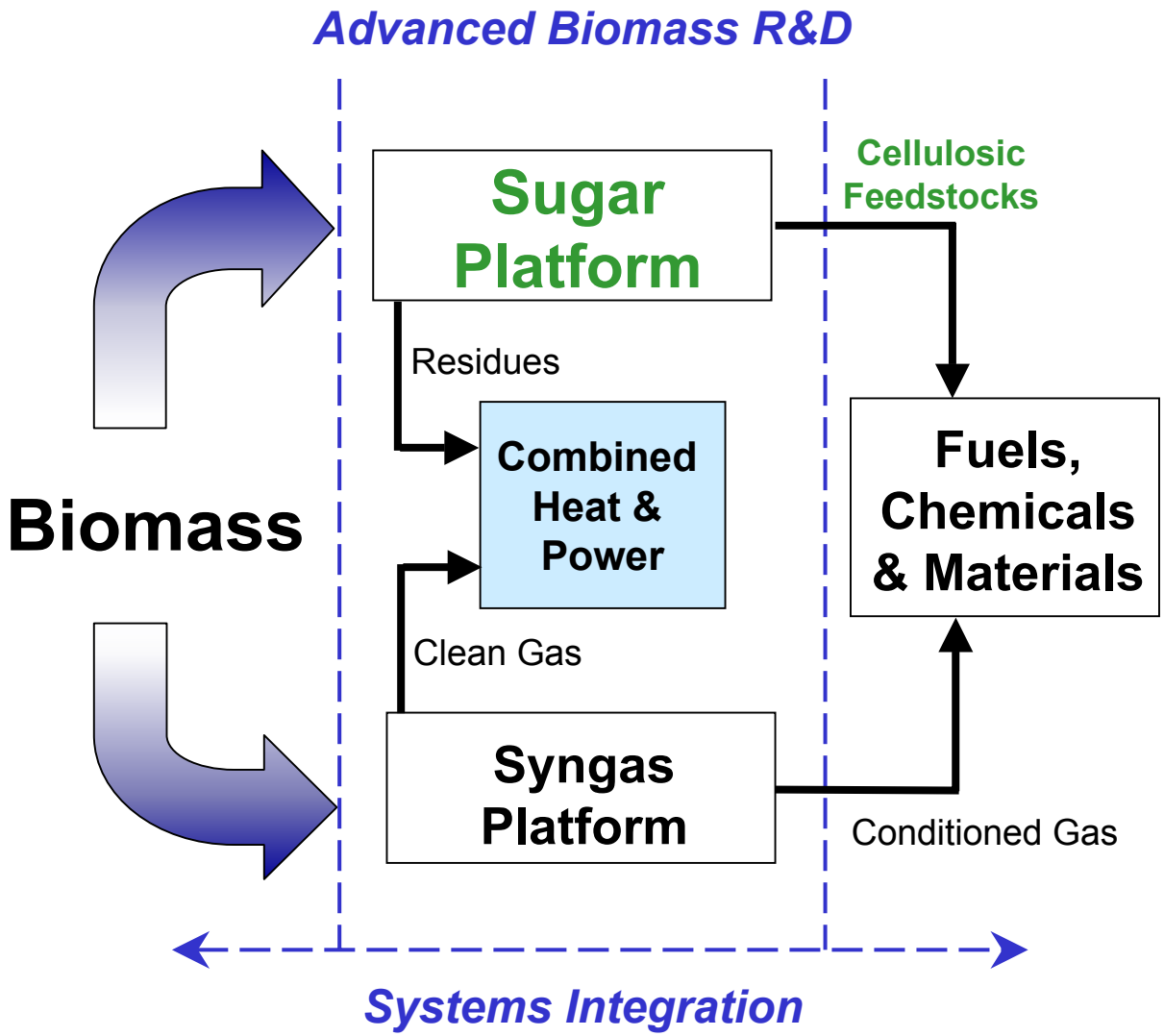
OBP Program Objectives

Draft MYPP milestones

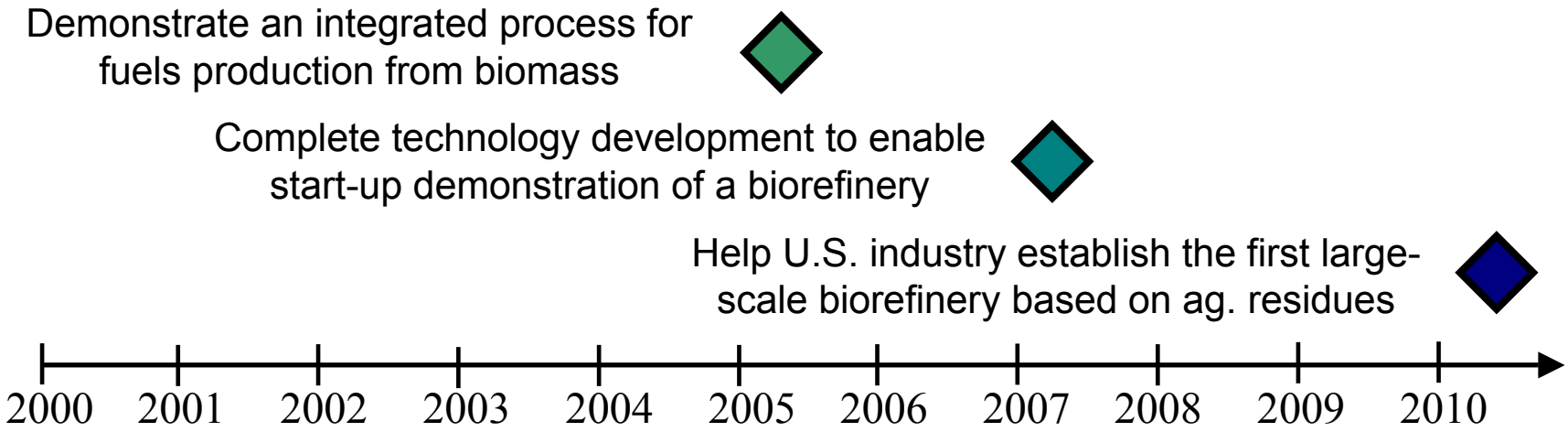
2005: Demonstrate an integrated process for fuels production from biomass

2007: Complete technology development needed to enable start-up demonstration of a biorefinery producing fuels, chemicals and power

2010: Help U.S. industry to establish the first large-scale biorefinery based on agricultural residues



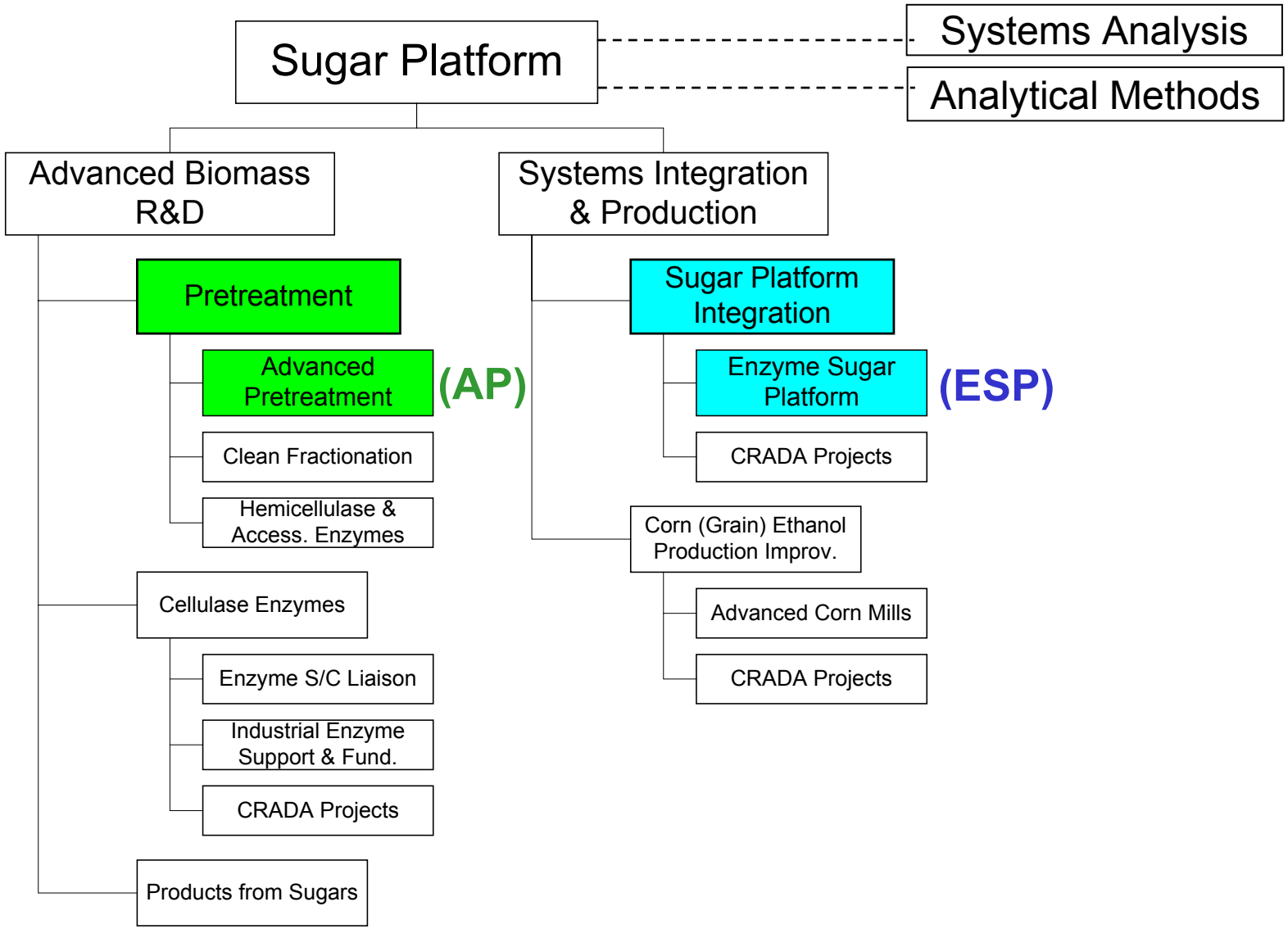
Enabling a New Bioindustry



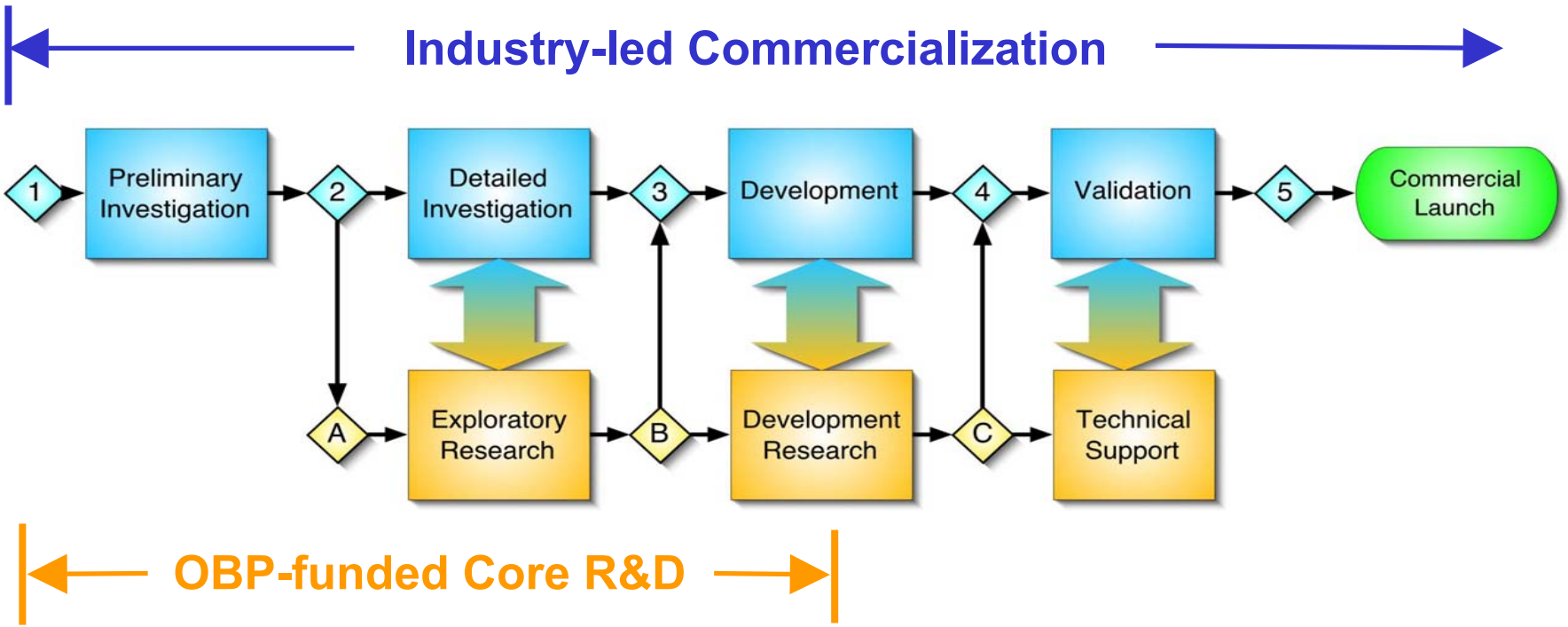
- ADM
- Arkenol
- BC Intn'l
- Broin
- Cargill
- Cargill Dow
- CRA
- DuPont
- High Plains
- ICPB
- Masada
- NCGA
- Williams
- Others – Your Company's Name Here

➢ ***Challenge: How to optimize core program R&D to best enable the new sugar platform-based bioindustry?***

NREL Biomass Program



Stage Gate Project Management

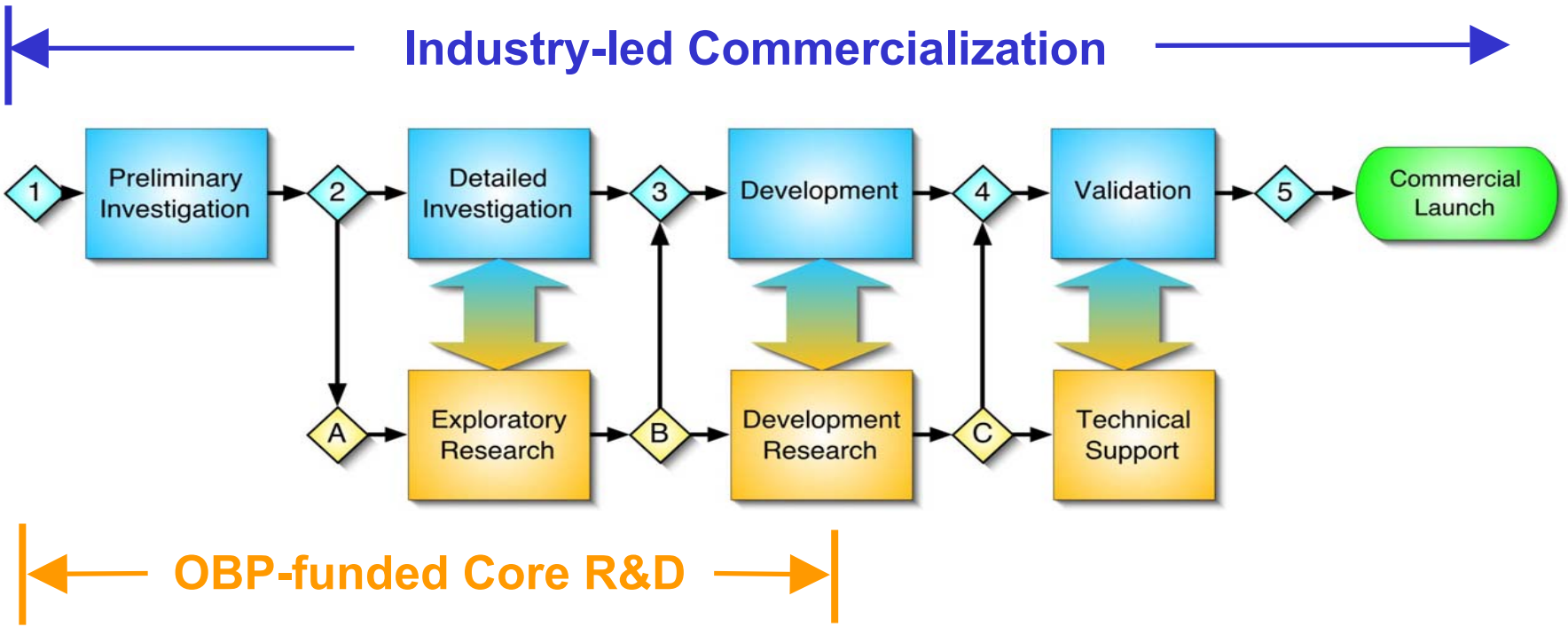


- *Core R&D facilitates industry-led process development by improving methods, tools and baseline knowledge that reduce risk and increase research efficiency.*

What Stage Gate Process Does

- Forces thorough upfront thinking/planning
  - Identify/clarify scope, expected work quality/depth and outcome(s), and project element/institution integration issues.
- Promotes effective dissemination of progress and timely feedback from industry customers
  - Achieved through periodic project reviews
- Enables decisions on strategic fit
  - Ensures that projects' R&D objectives align with Program goals and that projects fit well within the Program's overall project portfolio.

Stage Gate Project Management



- *The Stage Gate framework provides the critical link between Strategic/Tactical Plans and R&D projects.*
- *Stage Gate reviews are critical to the process!*

Review Objectives

- Establish common understanding and language within stakeholder community.
- Identify opportunities to focus R&D to best support development of a new Sugar Platform-based bioindustry
  - Provide feedback on strengths/weaknesses of recent/current/planned approaches and allocations.
  - Looking forward: What issues should have greater or lesser emphasis?

Stage Definitions

- Stage A: Exploratory Research (AP proj.)
  - Focus work on gaining knowledge and narrowing number of options to carry forward.
  - Verify importance of key questions/issues by consulting with related commercial track projects and interested stakeholders.
- Stage B: Development Research (ESP proj.)
  - Build on previous Stage learnings through a focused experimental program.
  - Develop the knowledge/capabilities to answer important scientific/technical questions and reduce performance/commercialization risk

Review Criteria Categories

- Strategic Fit
- Customer
- Technical Feasibility and Risks
- Competitive Advantage
- Legal/Regulatory Compliance
- Critical Success Factors and Showstoppers
- Plan to Proceed

Review Panels

- Enzyme Sugar Platform (in Stage B)
  - Charles Abbas, ADM
  - Dale Monceaux, Katzen International
  - Bob Sylvester, DuPont
  - Bob Wooley, Cargill Dow
- Advanced Pretreatment (in Stage A)
  - Susan Hennessey, DuPont
  - Frank Momany, USDA NCAUR
  - Jack Saddler, University of British Columbia
  - Pat Smith, Dow
- Facilitator (both reviews) – Lynn Billman

Meeting Format

- We have limited time for these reviews and ask for your help in keeping to the schedule.
  - Save questions until the Q&A sessions; only interrupt for clarifications.
  - Give the external reviewers the first opportunity to ask questions.
  - Other attendees can pose questions as time permits.
    - *We will also respond to questions submitted on the comment sheets. Please take the time to provide us with feedback.*

Review Schedule

MAY 1st

8:30am	ESP project review: Intro and analysis progress
9:45am	Break
10:00am	ESP project review: Experimental progress and next steps
12:00pm	Lunch
1:00pm	AP project review: Intro and applied progress
2:25pm	Break
2:40pm	AP project review: Fundamentals progress and next steps
5:00pm	Adjourn for the day

MAY 2nd

8:00am	Updates: Enzymes, Analytical methods, Partnerships
9:20am	Break
9:30am	ESP project feedback session
10:40am	Break
10:50am	AP project feedback session
12:00pm	Lunch
1:00pm	Concluding remarks from both projects
2:00pm	Meeting adjourned
2:30pm	Tours of NREL's Alternative Fuels User Facility (AFUF)

Questions on Structure or Process?